

WHAT IS CLAIMED IS:

1 1. An operational amplifier having a low impedance input
2 and a high current gain output, said operational amplifier
3 comprising:

4 a first N-channel transistor having a source coupled to
5 said low impedance input of said operational amplifier;

6 a first constant current source coupled between said
7 source of said first N-channel transistor and ground;

8 a first amplifier stage having an input coupled to said
9 first N-channel transistor source and an inverting output coupled
10 to a gate of said first N-channel transistor;

11 a second amplifier stage having an input coupled to a
12 drain of said first N-channel transistor and an output coupled to
13 said high current gain output of said operational amplifier; and

14 an internal compensation capacitor coupled between said
15 input and said output of said second amplifier stage.

1 2. The operational amplifier as set forth in Claim 1
2 further comprising a second constant current source coupled
3 between said drain of said first N-channel transistor and a
4 positive power supply.

1 3. The operational amplifier as set forth in Claim 2
2 wherein said first amplifier stage comprises a second N-channel
3 transistor having a gate coupled to said source of said first N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said inverting output of said first amplifier stage.

1 4. The operational amplifier as set forth in Claim 3
2 wherein said drain of second N-channel transistor is further
3 coupled to a third constant current source.

1 5. The operational amplifier as set forth in Claim 4
2 wherein said second amplifier stage comprises a third N-channel
3 transistor having a gate coupled to said input of second
4 amplifier stage, a source coupled to a fourth constant current
5 source, and a drain coupled to said positive power supply.

1 6. The operational amplifier as set forth in Claim 5
2 wherein said second amplifier stage comprises a fourth N-channel
3 transistor having a gate coupled to said source of said third N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said output of said second amplifier stage.

1 7. A low-pass filter having a cutoff frequency of $F(\omega)$
2 comprising:

3 an operational amplifier having a low impedance input
4 capable of being coupled to a signal source and a high current
5 gain output capable of being coupled to an impedance load, said
6 operational amplifier comprising:

7 a first N-channel transistor having a source
8 coupled to said low impedance input of said operational
9 amplifier;

10 a first constant current source coupled between
11 said source of said first N-channel transistor and ground;

12 a first amplifier stage having an input coupled
13 to said first N-channel transistor source and an inverting
14 output coupled to a gate of said first N-channel
15 transistor;

16 a second amplifier stage having an input coupled
17 to a drain of said first N-channel transistor and an output
18 coupled to said high current gain output of said
19 operational amplifier; and

20 an internal compensation capacitor coupled
21 between said input and said output of said second amplifier
22 stage; and

23 an external feedback resistor coupled between said low
24 impedance input and a high current gain output of said
25 operational amplifier, wherein a unity gain frequency of said

26 operational amplifier is established by said external feedback
27 resistor and said internal compensation capacitor at a frequency
28 less than twice said cutoff frequency, $F(\text{co})$.

1 8. The low-pass filter as set forth in Claim 7 further
2 comprising a second constant current source coupled between said
3 drain of said first N-channel transistor and a positive power
4 supply.

1 9. The low-pass filter as set forth in Claim 8 wherein
2 said first amplifier stage comprises a second N-channel
3 transistor having a gate coupled to said source of said first N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said inverting output of said first amplifier stage.

1 10. The low-pass filter as set forth in Claim 9 wherein
2 said drain of said second N-channel transistor is further coupled
3 to a third constant current source.

1 11. The low-pass filter as set forth in Claim 10 wherein
2 said second amplifier stage comprises a third N-channel
3 transistor having a gate coupled to said input of second
4 amplifier stage, a source coupled to a fourth constant current
5 source, and a drain coupled to said positive power supply.

1 12. The low-pass filter as set forth in Claim 11 wherein
2 said second amplifier stage comprises a fourth N-channel
3 transistor having a gate coupled to said source of said third N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said output of said second amplifier stage.

1 13. An operational amplifier having a low impedance input
2 and a high current gain output, said operational amplifier
3 comprising:

4 a first P-channel transistor having a source coupled to
5 said low impedance input of said operational amplifier;

6 a first constant current source coupled between said
7 source of said first P-channel transistor and a positive power
8 supply;

9 a first amplifier stage having an input coupled to said
10 first P-channel transistor source and an inverting output coupled
11 to a gate of said first P-channel transistor;

12 a second amplifier stage having an input coupled to a
13 drain of said first P-channel transistor and an output coupled to
14 said high current gain output of said operational amplifier; and

15 an internal compensation capacitor coupled between said
16 input and said output of said second amplifier stage.

1 14. The operational amplifier as set forth in Claim 13
2 further comprising a second constant current source coupled
3 between said drain of said first P-channel transistor and ground.

1 15. The operational amplifier as set forth in Claim 14
2 wherein said first amplifier stage comprises a first N-channel
3 transistor having a gate coupled to said source of said first P-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said inverting output of said first amplifier stage.

1 16. The operational amplifier as set forth in Claim 15
2 wherein said drain of said first N-channel transistor is further
3 coupled to a third constant current source.

1 17. The operational amplifier as set forth in Claim 16
2 wherein said second amplifier stage comprises a second N-channel
3 transistor having a gate coupled to said input of second
4 amplifier stage, a source coupled to a fourth constant current
5 source, and a drain coupled to said positive power supply.

1 18. The operational amplifier as set forth in Claim 17
2 wherein said second amplifier stage comprises a third N-channel
3 transistor having a gate coupled to said source of said second N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said output of said second amplifier stage.

1 19. A low-pass filter having a cutoff frequency of $F(\omega)$
2 comprising:

3 an operational amplifier having a low impedance input
4 capable of being coupled to a signal source and a high current
5 gain output capable of being coupled to an impedance load, said
6 operational amplifier comprising:

7 a first P-channel transistor having a source
8 coupled to said low impedance input of said operational
9 amplifier;

10 a first constant current source coupled between
11 said source of said first P-channel transistor and a
12 positive power supply;

13 a first amplifier stage having an input coupled
14 to said first P-channel transistor source and an inverting
15 output coupled to a gate of said first P-channel
16 transistor;

17 a second amplifier stage having an input coupled
18 to a drain of said first P-channel transistor and an output
19 coupled to said high current gain output of said
20 operational amplifier;

21 an internal compensation capacitor coupled
22 between said input and said output of said second amplifier
23 stage; and

24 an external feedback resistor coupled between said low
25 impedance input and a high current gain output of said

26 operational amplifier, wherein a unity gain frequency of said
27 operational amplifier is established by said external feedback
28 resistor and said internal compensation capacitor at a frequency
29 less than twice said cutoff frequency, $F(\text{co})$.

1 20. The low-pass filter as set forth in Claim 19 further
2 comprising a second constant current source coupled between said
3 drain of said first P-channel transistor and ground.

1 21. The low-pass filter as set forth in Claim 20 wherein
2 said first amplifier stage comprises a first N-channel transistor
3 having a gate coupled to said source of said first P-channel
4 transistor, a source coupled to ground, and a drain coupled to
5 said inverting output of said first amplifier stage.

1 22. The low-pass filter as set forth in Claim 21 wherein
2 said drain of said first N-channel transistor is further coupled
3 to a third constant current source.

1 23. The low-pass filter as set forth in Claim 22 wherein
2 said second amplifier stage comprises a second N-channel
3 transistor having a gate coupled to said input of second
4 amplifier stage, a source coupled to a fourth constant current
5 source, and a drain coupled to said positive power supply.

1 24. The low-pass filter as set forth in Claim 23 wherein
2 said second amplifier stage comprises a third N-channel
3 transistor having a gate coupled to said source of said second N-
4 channel transistor, a source coupled to ground, and a drain
5 coupled to said output of said second amplifier stage.